UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

Memorandum

Date: August 29, 2001

SUBJECT: Potatoes Initial Benefits Assessment for Azinphos-methyl and Phosmet

FROM: William L. Gross Jr., Senior Entomologist
Herbicide and Insecticide Branch

David Donaldson, Economist
Economic Analysis Branch

THROUGH: David Brassard, Senior Scientist
Jonathan Becker, Acting Chief
Herbicide and Insecticide Branch

Arthur Grube, Senior Scientist
David Widawsky, Acting Chief
Economic Analysis Branch

TO: Diane Isbell, Chemical Review Manager
Veronique LaCapra, Chemical Review Manager
Margaret Rice, Chief
Reregistration Branch 2
Special Review and Reregistration Division (7508C)

CC: Denise Keehner, Director
Biological and Economic Analysis Division

SUMMARY

Based on available published data and personal communications with crop experts, BEAD believes that the impacts resulting from extending the restricted entry intervals on potatoes for either phosmet or azinphos-methyl will be insignificant. We have arrived at this conclusion based primarily on the fact that grower production practices are not likely to be affected by the extension of the restricted entry intervals. If for some reason grower production practices were significantly impacted by an extension of the REIs, BEAD believes that they would be replaced with one of several efficacious and similarly priced alternatives.

BACKGROUND

Dry land farmers usually plant potatoes on summer fallowed land or following cultivated crops such as corn or beans. Small grains are considered unsuitable preceding potatoes on dry land because they deplete the moisture in the soil. Summer fallowing the land before the potatoes are grown is the best method of moisture conservation. In some places where summer fallowed land blows badly, growers sow the land to grains in the

fall and plant potatoes the following spring. All desert potato producing areas in the Northwest are irrigated. Generally, irrigation is in a three day cycle with two days of irrigation followed by one day off. This cycle is used throughout the growing season. All commercial potatoes produced in the U.S. are machine harvested.

There are four different commercial potato crops produced in the United States: winter, spring, summer, and fall. Winter grown potatoes account for 1% of the harvested acres and 1% of the total production. Spring grown potatoes account for about 6% of the harvested acres and 5% of the total pounds of production. Summer grown potatoes account for about 5% of the harvested acres and 4% of the total pounds of production. Fall grown potatoes, accounts for about 88% of the harvested acres and 90% of the total pounds of production (Table 1).

Table 1. Potatoes: 1999 Area, Production, and Value of Production in the U.S. by production season and end-use.

U.S./State	Harvested Acreage	Production (million pounds)	Percent of U.S. Production	Value of Production ($1000)
United States	1,332,600	47,840	100%	$2,693,986
Winter	17,800	407	1%	$106,234
Spring	84,500	2,533	5%	$261,154
Summer	64,200	1,915	4%	$143,456
Fall	1,166,100	42,985	90%	$2,183,142

Source: USDA/NASS Agricultural Statistics 2000. Columns may not sum due to rounding.

Table 2, for the U.S. and for major states, lists significant commercial production of potatoes grown in all production seasons. The table provides data on harvested acres, pounds of production, percent of total U.S. production, and value of production. The data is from the National Agricultural Statistics Service's Agricultural Statistics 2000 and covers crop year 1999.

Total U.S. fresh potato production was 47.8 billion pounds in 1999, and was valued at $2.693 billion. The top six production States (in terms of pounds of production), which account for 73% of total U.S. production, are: Idaho (13.3 billion pounds), Washington (9.5 billion pounds), Wisconsin (3.4 billion pounds), Colorado (2.8 billion pounds), Oregon (2.8 billion pounds), and North Dakota (2.4 billion pounds) (Table 2).

Table 2. Potatoes: 1999 Area, Production, and Value of Production in the U.S. by Major State.

U.S./State	Harvested Acreage	Production (million pounds)	Percent of U.S. Production	Value of Production ($1000)
United States	1,332,600	47,840	100%	$2,693,986
California	52,800	1,925	4%	$225,820
Colorado	84,600	2,842	6%	$132,720
Idaho	393,000	13,333	28%	$606,652
Maine	62,500	1,781	4%	$114,894
Michigan	47,500	1,496	3%	$100,252
Minnesota	53,000	1,802	4%	$91,902
North Dakota	110,000	2,640	6%	$139,920

U.S./State	Harvested Acreage	Production (million pounds)	Percent of U.S. Production	Value of Production ($1000)
Oregon	55,500	2,802	6%	$141,501
Washington	170,000	9,520	20%	$456,960
Wisconsin	85,000	3,400	7%	$168,300

Source: USDA/NASS Agricultural Statistics 2000.

USE OF AZINPHOS-METHYL AND PHOSMET ON POTATOES

Azinphos-methyl

Table 3 lists the usage of azinphos-methyl on potatoes by state. Approximately 6% of the U.S. potato acreage is treated with azinphos-methyl per year, and 60,000 pounds of azinphos-methyl are applied. The table provides data on percent of crop treated, base acres treated, total pounds of active ingredient applied, average number of applications per year, and average application rates per acre.

Table 3. Azinphos-methyl use on Commercial Potatoes in Major State.

U.S./State	Percent of Crop Treated	Base Acres Treated (acres)[1]	Total Pounds Applied (lbs)	Average Number of Applications (#/year)	Average Application Rate (lbs/acre) [3]
United States[2]	6%	80,000	60,000	1.5	0.5
California[3]	1%	656	971	1.98	0.75
Colorado	0%	0	0	-	-
Idaho[4]	12%	47,000	27,800	1.0	0.59
Indiana	NP	NP	NP	NP	NP
Maine	3%	1,875	1,000	1.3	0.29
Maryland[4]	1%	50	14	1.0	0.62
Michigan[4]	12%	5,700	3,505	1.0	0.65
Minnesota	11%	5,830	3,000	1.0	0.39
New Jersey[4]	23%	575	374	1.0	0.65
New York[4]	2%	510	191	1.0	0.375
North Carolina[4]	3%	525	263	1.0	0.5
North Dakota	19%	20,900	12,000	1.0	0.48
Oregon[4]	12%	6,660	3,929	1.0	0.59
Pennsylvania	16%	2,240	2,000	1.0	0.64
Texas[4]	25%	4,450	2,181	1.0	0.49

U.S./State	Percent of Crop Treated	Base Acres Treated (acres)[1]	Total Pounds Applied (lbs)	Average Number of Applications (#/year)	Average Application Rate (lbs/acre) [3]
Utah[4]	1%	20	8	1.0	0.38
Virginia[4]	40%	2,400	1,488	1.0	0.62
Washington[4]	12%	20,400	12,036	1.0	0.59
Wisconsin	11%	9,350	6,000	1.0	0.58

Source: USDA/NASS Agricultural Chemical Use, Field Crop Summary 2000, unless otherwise indicated.
Note: Columns may not sum to U.S. totals because of rounding and use of different data sources.
'NP' indicates that usage was observed and that data were collected by NASS but were not published.
A dash (-) indicates that data were either not available or not applicable.
1. Base acres treated calculated using percent of crop treated estimates and acreage data from Tables 1, 2, 3, and 4.
2. Base acres treated and pounds of active ingredient applied, at the national level, were calculated using the percent of acres treated and the average application rate per year per acre from the U.S. EPA Quantitative Usage Analysis (QUA) of 4/99 and acres harvested from Table 1. The QUA estimates an average of 6% of the total potato crop treated and 65,000 pounds of active ingredient applied in the U.S. Based on ten years of data and multiple data sources.
3. Source: California Department of Pesticide Regulation, average of 1998 and 1999 census data.
4. Percent of base acres treated, application rate per acre, and number of applications per year are from the National Center for Food and Agricultural Policy (NCFAP), 1997 estimates. Base acres treated and total pounds of active ingredient are calculated using these estimates and acres harvested from Table 1. NASS surveyed and observed azinphos-methyl usage in Michigan and Washington but, because data were not published, NCFAP 1997 data were used.

According to experts, in 1997, there was little use of azinphos-methyl on potatoes in the Northwestern United States. However, in the region, the use of azinphos-methyl has increased since this time. In the Pacific Northwest, azinphos-methyl is used primarily to control Colorado potato beetle. In this region, this beetle is still susceptible to almost all insecticides and has not developed the level of insecticide resistance that is seen in the South, Southeast and Northeast (imidicloprid is used in these regions for this pest). Experts contacted claim that the reason for the increased use is because the product is relatively inexpensive and is an alternative to the synthetic pyrethroids.

Azinphos-methyl is labeled for potatoes to control banded cucumber beetles, leafminers, European corn borer, flea beetles, leafhoppers, spittlebug, tarnished plant bug, and potato tuberworm. Labeled rates of application range from 0.375 to 0.75 lb ai/acre with a maximum of 3 applications per season.

Based on observed usage (surveys of pesticide usage), the potato target pests for azinphos-methyl are listed in Table 4. Nearly all of azinphos-methyl usage on potato is for the control of these five target pests. Most usage (or approximately 80% of total azinphos-methyl usage on potatoes is for the control of Colorado potato beetle. The application of azinphos-methyl for the control of flea beetles, leafhoppers, aphids, and armyworms each account for about 5% of total usage.

On average, from 1996 to 2000, azinphos-methyl usage accounted for about 3% of total insecticide usage on potatoes. By pest for all insecticides, usage of azinphos-methyl on potato accounted for about 5% of total insecticide usage for control of Colorado potato beetle, 6% of total insecticide usage for control of flea beetle, 1% of total insecticide usage for control of leafhopper, less than 1% of total insecticide usage for control of aphids, and about 7% of total insecticide usage for control of armyworms.

Table 4. Target Pests for Azinphos-methyl.

Active Ingredient	Target Pest - Listed in Order of Importance (Based on Estimated Usage by Pest [1])
Azinphos-methyl	Colorado Potato Beetle Flea Beetle Leafhopper Aphid Armyworm

Source: EPA proprietary data.

1. Importance based on the proportion of total azinphos-methyl usage (total acre treatments) for the control of the pest.

As stated above, about 80% of all azinphos-methyl is applied to control the Colorado potato beetle. Azinphos-methyl, however, holds a small share (about 5%) of this total insecticide pest market combination and in terms of acres treated ranks number eight.

Imidacloprid, carbofuran, permethrin, and phorate are the leading insecticides used on potatoes to control Colorado potato beetle and cumulatively hold about 60% of the total market. Table 5, in order of importance, lists potato insecticides used to control the Colorado potato beetle with order of importance based on market share.

Table 5. Leading Insecticides used for control of the Colorado Potato Beetle.

Pest	Insecticide - Listed in Order of Importance (Based on Estimated Usage by Pest [1])
Colorado Potato Beetle	Imidacloprid Carbofuran Permethrin Phorate Esfenvalerate Endosulfan Methamidophos Azinphos-methyl Aldicarb Methyl Parathion Dimethoate

Sources: Target Pest Usage - EPA proprietary data.

1. Importance based on the proportion of total insecticide usage (total acre treatments) for the control of Colorado potato beetle.

Phosmet

Table 6 lists the usage of phosmet on potatoes by state. The table provides data on percent of crop treated, base acres treated, total pounds of active ingredient applied, average number of applications per year, and average application rates per acre. Most of the data is from the National Agricultural Statistics Service's Agricultural Chemical Usage, Field Crop Summary covering crop year 1999. California usage data, however, is from the California Department of Pesticide Regulation's Pesticide Use Report while usage data for several states are from the National Center for Food and Agricultural Policy.

Approximately 4% of the U.S. potato acreage is treated with phosmet per year, and 41,577 pounds of phosmet are applied (Table 6).

Table 6. Phosmet use on Commercial Potatoes by Major State.

U.S./State	Percent of Crop Treated	Base Acres Treated (acres)[1]	Total Pounds Applied (lbs)	Average Number of Applications (#/year)	Average Application Rate (lbs/acre) [3]
United States[2]	1%	13,326	19,989	1.5	1.0
California[3]	0%	0	0	0	0
Colorado	0%	0	0	0	0
Idaho	NP	NP	NP	NP	NP
Indiana	NP	NP	NP	NP	NP
Maine[4]	8%	5,000	4,850	1.0	0.97
Michigan	< 1%	< 475	< 456	1.0	0.96
Minnesota	NP	NP	NP	NP	NP
New Jersey[4]	1%	25	64	1.0	2.57
New York[4]	3%	765	689	1.0	0.90
North Dakota	NP	NP	NP	NP	NP
Oregon	0%	0	0	0	0
Pennsylvania[5]	< 3%	< 2,550	< 1,709	1.0	0.67
Virginia[4]	28%	1,680	1,142	1.0	0.68
Washington	NP	NP	NP	NP	NP
Wisconsin	39%	33,150	26,852	1.2	0.63

Source: USDA/NASS Agricultural Chemical Use, Field Crop Summary 2000, unless otherwise indicated.
Note: Columns may not sum to U.S. totals because of rounding and use of different data sources.
'NP' indicates that usage was observed and that data were collected by NASS but were not published.
A dash (-) indicates that data were either not available or not applicable.

1. Base acres treated calculated using percent of crop treated estimates and acreage data from Table 2.
2. Base acres treated and pounds of active ingredient applied, at the national level, were calculated using the percent of acres treated and the average application rate per year per acre from the U.S. EPA Quantitative Usage Analysis (QUA) of 4/99 and acres harvested from table 2. The QUA estimates an average of 1% of the total potato crop treated and 28,000 pounds of active ingredient applied in the U.S. Based on ten years of data and multiple data sources.
3. Source: California Department of Pesticide Regulation, average of 1998 and 1999 census data.
4. Percent of base acres treated, application rate per acre, and number of applications per year are from the National Center for Food and Agricultural Policy (NCFAP), 1997 estimates. Base acres treated and total pounds of active ingredient are calculated using these estimates and acres harvested from table 1. NASS surveyed and observed azinphos methyl usage in Michigan and Washington but, because data were not published, NCFAP 1997 data were used.
5. Source: USDA/NASS Agricultural Chemical Use, Field Crop Summary 1999.

RESTRICTED ENTRY INTERVALS

Azinphos-methyl - The current label indicates that there is a 2 day restricted entry interval (REI) for scouting and irrigating potatoes and a 4 day REI for all other activities. Please refer to the occupational and residential human health risk assessment on the Agency's website (http://www.epa.gov/pesticides/op) for information concerning the worker risks associated with the restricted entry intervals for this chemical. All commercial potatoes grown in the U.S. are machine harvested and thus worker exposure from harvesting is expected to be low.

Phosmet – The current label indicates that there is a 24 hour restricted entry interval (REI) on potatoes. Please refer to the occupational and residential human health risk assessment on the Agency's website (http://www.epa.gov/pesticides/op) for information concerning the worker risks associated with the restricted entry intervals for this chemical. Again, all commercial potatoes grown in the U.S. are machine harvested and thus worker exposure from harvesting is expected to be low.

IMPACTS RELATED TO OCCUPATIONAL RISK MITIGATION

Potato growers have access to several efficacious alternative insecticides, some of which are currently used and some of which are not. These alternatives include: esfenvalerate, carbaryl, cryolite, diazinon, dimethoate, disulfoton, endosulfan, imidacloprid, phosmet, and methamidophos. Thus, BEAD concludes that further restriction of azinphos-methyl will not significantly impact potato producers even if they must switch to other active ingredients.

Based on the fact that it is unlikely that potato production practices will be affected and on the availability of numerous efficacious alternatives, BEAD believes that extending the restricted entry intervals for phosmet or azinphos-methyl would have no significant impact on potato growers.

LITERATURE CITED

Insect and Disease Guide (1999). MeisterPro Reference Guides. 602 pages.

Bechinski et al. (1999) Idaho Potato Crop Profile.

Ora Smith, Ph.D. (1977), The Avi Publishing Company, Inc.